

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
540 S. MORRIS AVE., MONTGOMERY, AL 36115
GAMMA ANALYSES**

REPORT OF SAMPLE DELIVERY GROUP #1000029

Project: Smokey Mountain Smelter, Knoxville, TN
Analysis Procedure: Gamma Spectrometry
Report ID: 1000029-GAMMA
Report Type: Original
Date Reported: 10/08/2010
Total Pages in Report: 18

SAMPLES

NAREL Sample #	Client Sample ID	Type	Matrix	Date Collected	Date Received
B0.07995U	03377 5-7 CM	SAM	SOIL	09/09/2010	09/17/2010
B0.07996V	03378 5-7 CM	SAM	SOIL	09/09/2010	09/17/2010
B0.07997W	03379 5-7 CM	SAM	SOIL	09/09/2010	09/17/2010
B0.07998X	03380 5-7 CM	SAM	SOIL	09/09/2010	09/17/2010
B0.07999Y	03381 5-7 CM	SAM	SOIL	09/09/2010	09/17/2010
B0.08000U	03045 5-7 CM	SAM	SOIL	09/09/2010	09/17/2010
B0.08001V	03046 5-7 CM	SAM	SOIL	09/09/2010	09/17/2010
B0.08002W	03047 5-7 CM	SAM	SOIL	09/09/2010	09/17/2010

EXCEPTIONS

1. Packaging and Shipping - No problems were observed.
2. Documentation - No problems were observed.
3. Sample Preparation - No problems were encountered.
4. Analysis - No problems were encountered.
5. Holding Times - All holding times were met.

QUALITY CONTROL

1. QC samples - All QC analysis results met NAREL acceptance criteria.
2. Instruments - Response and background checks for all instruments used in these analyses met NAREL acceptance criteria.

CERTIFICATION

I certify that this data report complies with the terms and conditions of the Quality Assurance Project Plan, except as noted above. Release of the data contained in this report has been authorized by the Director of the Center for Environmental Radioanalytical Laboratory Science and the NAREL Quality Assurance Manager, or their designees, as verified by the following signatures.

Mary Wisdom
Mary F. Wisdom
Quality Assurance Manager, NAREL

10-19-10
Date

John Griggs
John G. Griggs, Ph.D.
Director, Center for Environmental Radioanalytical
Laboratory Science

10/19/10
Date

GENERAL INFORMATION

SAMPLE TYPES

BLD	Blind sample
FBK	Field blank
SAM	Normal sample

ANALYSIS QC TYPES

ANA	Normal analysis
DUP	Laboratory duplicate
LCS	Laboratory control sample (blank spike)
MS	Matrix spike
MSD	Matrix spike duplicate
RBK	Method blank

QUALITY INDICATORS

RPD	Relative Percent Difference
%R	Percent Recovery
Z	Number of standard deviations by which a QC measurement differs from the expected value

EVALUATION OF QC ANALYSES

A method blank result is considered unacceptable if it is more than 3 standard deviations below zero or more than 3 standard deviations above a predetermined upper control limit. For some analyses NAREL has set the upper control limit at zero. For others the control limit is a small positive number.

NAREL evaluates the results of duplicate and spike analyses using "Z scores." A Z score is the number of standard deviations by which the QC result differs from its ideal value. The score is considered acceptable if its absolute value is not greater than 3.

The Z score for a spiked sample is computed by dividing the difference between the measured value and the target value by the combined standard uncertainty of the difference.

The Z score for a duplicate analysis is computed by dividing the difference between the two measured values by the combined standard uncertainty of the difference. When the precision of paired MS/MSD analyses is evaluated, the native sample activity is subtracted from each measured value and the net concentrations are then converted to total activities before the Z score is computed.

Each standard uncertainty used to compute a Z score includes an additional fixed term to represent sources of measurement error other than counting error. This additional term is not used in the evaluation of reagent blanks.

NAREL reports the "relative percent difference," or RPD, between duplicate results and the "percent recovery," or %R, for spiked analyses, but does not use these values for evaluation.

GENERAL INFORMATION (CONTINUED)

GAMMA ANALYSIS

The reporting format lists the gamma emitters in alphabetical order. The activity and 2-sigma uncertainty for radionuclides measured by gamma spectroscopy are reported only if the nuclide is detected. Nuclides that are not detected do not appear in the report, with the exception of Ba-140, Co-60, Cs-137, I-131, K-40, Ra-226 and Ra-228. If one of these seven nuclides is undetected, NAREL reports it as "Not Detected" or "ND", and provides a sample-specific estimate of the MDC.

Due to potential spectral interferences and other possible problems associated with the determination of the activity of certain radionuclides, the activities for Bi-214, Pb-214, Th-234, Pa-234m, Ra-226, Th-231, and U-235 are subject to greater possible uncertainty than other commonly reported radionuclides. It should be noted that this potential uncertainty is not included in the two-sigma counting uncertainty which is reported with each activity. Although in this report we do provide the calculated activities for these radionuclides, we recommend that the results be used only as a qualitative means of indicating the presence of these radionuclides and not as a quantitative measure of their concentration. The results for these nuclides are not used in the evaluation of quality control samples. Furthermore, because of mutual interference between Ra-226 and U-235, NAREL's gamma analysis software tends to overestimate the amounts of these nuclides whenever both are present in a sample. Lower estimates for Ra-226 activities can be obtained from the reported activities of its decay products, Pb-214 and Bi-214, which are likely to be somewhat less than the Ra-226 activity because of the potential escape of radon gas.

NAREL's gamma spectroscopy software corrects activities and MDCs for decay between collection and analysis, but only up to a limit of ten half-lives. So, if the decay time for a sample is more than ten half-lives of a radionuclide, that nuclide will almost always be undetected and the reported MDC will be meaningless. This is usually a problem only for short-lived radionuclides, such as I-131 and Ba-140, when there is a long delay between collection and analysis.

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NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1000029

ANALYSIS SUMMARY

Analysis Procedure: NAREL GAM-01
Title: Gamma Spectrometry

NAREL Sample #	QC Type	Preparation Procedure	Date Completed	Assay Batch #	QC Batch #
B0.07995U		N/A	10/01/2010	0014432V	0007002Y
B0.07996V		N/A	10/01/2010	0014432V	0007002Y
B0.07997W		N/A	10/06/2010	0014432V	0007002Y
B0.07998X		N/A	10/01/2010	0014432V	0007002Y
B0.07999Y		N/A	10/01/2010	0014432V	0007002Y
B0.08000U		N/A	10/01/2010	0014432V	0007002Y
B0.08000U	DUP	N/A	10/05/2010	0014432V	0007002Y
B0.08001V		N/A	10/01/2010	0014432V	0007002Y
B0.08002W		N/A	10/01/2010	0014432V	0007002Y
LCS-00592060D *	LCS	N/A	10/06/2010	0014432V	0007002Y
RBK-00592059L *	RBK	N/A	10/05/2010	0014432V	0007002Y

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

PREPARATION METHOD(S) USED

Procedure ID	Title

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SDG #1000029

SAMPLE ANALYSIS REPORT

Sample #:	B0.07995U	QC batch #:	0007002Y
Matrix:	SOIL	Assay batch #:	0014432V
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	4.770e+02 GDRY	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	81.83 %	Analyst:	RCL
Ash/dry weight:	94.79 %	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/30/2010 15:34	1000.0	GE06	RCL

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Ba140	ND		5.4e-01	PCI/GDRY	09/09/2010
Bi212	4.75e-01	2.8e-01		PCI/GDRY	09/09/2010
Bi214 *	3.36e+01	3.9e+00		PCI/GDRY	09/09/2010
Co60	ND		5.9e-02	PCI/GDRY	09/09/2010
Cs137	5.89e-02	2.8e-02		PCI/GDRY	09/09/2010
I131	ND		2.9e-01	PCI/GDRY	09/09/2010
K40	1.37e+00	3.2e-01		PCI/GDRY	09/09/2010
Pa231	9.77e-01	4.6e-01		PCI/GDRY	09/09/2010
Pb211	1.92e+00	7.9e-01		PCI/GDRY	09/09/2010
Pb212	7.95e-01	1.0e-01		PCI/GDRY	09/09/2010
Pb214 *	3.51e+01	4.0e+00		PCI/GDRY	09/09/2010
Ra223 *	1.87e+00	2.7e-01		PCI/GDRY	09/09/2010
Ra226 *	3.98e+01	4.6e+00		PCI/GDRY	09/09/2010
Ra228	6.38e-01	1.0e-01		PCI/GDRY	09/09/2010
Rn219	1.89e+00	2.7e-01		PCI/GDRY	09/09/2010
Th227	1.30e+00	2.0e-01		PCI/GDRY	09/09/2010
Th234 *	3.51e+01	4.1e+00		PCI/GDRY	09/09/2010
Tl208	2.40e-01	3.9e-02		PCI/GDRY	09/09/2010
U235 *	1.66e+00	2.0e-01		PCI/GDRY	09/09/2010

* An asterisk indicates a result that may be significantly under or overestimated

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SAMPLE ANALYSIS REPORT

Sample #:	B0.07996V	QC batch #:	0007002Y
Matrix:	SOIL	Assay batch #:	0014432V
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	4.300e+02 GDRY	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	87.60 %	Analyst:	RCL
Ash/dry weight:	91.54 %	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/30/2010 15:34	1000.0	GE07	RCL

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Ba140	ND		5.0e-01	PCI/GDRY	09/09/2010
Bi212	1.05e+00	3.3e-01		PCI/GDRY	09/09/2010
Bi214 *	2.04e+01	2.3e+00		PCI/GDRY	09/09/2010
Co60	ND		5.3e-02	PCI/GDRY	09/09/2010
Cs137	ND		6.3e-02	PCI/GDRY	09/09/2010
I131	ND		2.6e-01	PCI/GDRY	09/09/2010
K40	4.23e+00	5.6e-01		PCI/GDRY	09/09/2010
Pb211	6.84e-01	4.3e-01		PCI/GDRY	09/09/2010
Pb212	1.17e+00	1.4e-01		PCI/GDRY	09/09/2010
Pb214 *	2.15e+01	2.5e+00		PCI/GDRY	09/09/2010
Ra223 *	1.32e+00	2.2e-01		PCI/GDRY	09/09/2010
Ra226 *	2.90e+01	3.4e+00		PCI/GDRY	09/09/2010
Ra228	1.17e+00	1.6e-01		PCI/GDRY	09/09/2010
Rn219	9.75e-01	1.7e-01		PCI/GDRY	09/09/2010
Th227	7.66e-01	1.5e-01		PCI/GDRY	09/09/2010
Th234 *	1.86e+01	2.2e+00		PCI/GDRY	09/09/2010
Tl208	3.73e-01	5.0e-02		PCI/GDRY	09/09/2010
U235 *	6.91e-01	9.0e-02		PCI/GDRY	09/09/2010

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SDG #1000029

SAMPLE ANALYSIS REPORT

Sample #:	B0.07997W	QC batch #:	0007002Y
Matrix:	SOIL	Assay batch #:	0014432V
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	5.060e+02 GDRY	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	87.60 %	Analyst:	RCL
Ash/dry weight:	95.88 %	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/05/2010 15:57	1000.0	GE03	RCL

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Ba140	ND		5.4e-01	PCI/GDRY	09/09/2010
Bi212	7.85e-01	2.7e-01		PCI/GDRY	09/09/2010
Bi214 *	3.15e+01	3.6e+00		PCI/GDRY	09/09/2010
Co60	ND		4.3e-02	PCI/GDRY	09/09/2010
Cs137	5.33e-02	1.9e-02		PCI/GDRY	09/09/2010
I131	ND		3.3e-01	PCI/GDRY	09/09/2010
K40	2.32e+00	3.4e-01		PCI/GDRY	09/09/2010
Pa231	3.24e-01	3.0e-01		PCI/GDRY	09/09/2010
Pb211	1.88e+00	5.3e-01		PCI/GDRY	09/09/2010
Pb212	7.94e-01	9.9e-02		PCI/GDRY	09/09/2010
Pb214 *	3.32e+01	3.8e+00		PCI/GDRY	09/09/2010
Ra226 *	3.13e+01	3.6e+00		PCI/GDRY	09/09/2010
Ra228	8.53e-01	1.1e-01		PCI/GDRY	09/09/2010
Rn219	1.51e+00	2.2e-01		PCI/GDRY	09/09/2010
Th227	1.12e+00	1.6e-01		PCI/GDRY	09/09/2010
Th234 *	2.30e+01	2.7e+00		PCI/GDRY	09/09/2010
Tl208	2.43e-01	3.4e-02		PCI/GDRY	09/09/2010
U235 *	1.79e+00	2.1e-01		PCI/GDRY	09/09/2010

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SDG #1000029

SAMPLE ANALYSIS REPORT

Sample #:	B0.07998X	QC batch #:	0007002Y
Matrix:	SOIL	Assay batch #:	0014432V
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	4.580e+02 GDRY	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	87.98 %	Analyst:	RCL
Ash/dry weight:	91.93 %	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/30/2010 15:34	1000.0	GE09	RCL

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Ba140	ND		5.5e-01	PCI/GDRY	09/09/2010
Bi212	7.66e-01	2.8e-01		PCI/GDRY	09/09/2010
Bi214 *	2.62e+01	3.0e+00		PCI/GDRY	09/09/2010
Co60	ND		5.6e-02	PCI/GDRY	09/09/2010
Cs137	6.96e-02	2.5e-02		PCI/GDRY	09/09/2010
I131	ND		3.1e-01	PCI/GDRY	09/09/2010
K40	3.71e+00	5.1e-01		PCI/GDRY	09/09/2010
Pb211	1.96e+00	8.3e-01		PCI/GDRY	09/09/2010
Pb212	9.55e-01	1.3e-01		PCI/GDRY	09/09/2010
Pb214 *	2.75e+01	3.2e+00		PCI/GDRY	09/09/2010
Ra223 *	1.58e+00	2.8e-01		PCI/GDRY	09/09/2010
Ra226 *	3.34e+01	3.9e+00		PCI/GDRY	09/09/2010
Ra228	8.36e-01	1.2e-01		PCI/GDRY	09/09/2010
Rn219	1.15e+00	2.9e-01		PCI/GDRY	09/09/2010
Th227	1.14e+00	2.2e-01		PCI/GDRY	09/09/2010
Th234 *	2.73e+01	3.3e+00		PCI/GDRY	09/09/2010
Tl208	2.79e-01	4.5e-02		PCI/GDRY	09/09/2010
U235 *	9.22e-01	1.2e-01		PCI/GDRY	09/09/2010

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SDG #1000029

SAMPLE ANALYSIS REPORT

Sample #:	B0.07999Y	QC batch #:	0007002Y
Matrix:	SOIL	Assay batch #:	0014432V
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	3.490e+02 GDRY	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	79.17 %	Analyst:	RCL
Ash/dry weight:	84.96 %	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/30/2010 15:34	1000.0	GE12	RCL

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Ba140	ND		3.4e-01	PCI/GDRY	09/09/2010
Bi212	9.54e-01	2.5e-01		PCI/GDRY	09/09/2010
Bi214 *	1.24e+01	1.4e+00		PCI/GDRY	09/09/2010
Co60	ND		4.1e-02	PCI/GDRY	09/09/2010
Cs137	4.62e-01	5.7e-02		PCI/GDRY	09/09/2010
I131	ND		1.8e-01	PCI/GDRY	09/09/2010
K40	8.47e+00	1.0e+00		PCI/GDRY	09/09/2010
Pb210 *	8.81e+00	1.1e+00		PCI/GDRY	09/09/2010
Pb211	8.53e-01	5.8e-01		PCI/GDRY	09/09/2010
Pb212	9.41e-01	1.1e-01		PCI/GDRY	09/09/2010
Pb214 *	1.35e+01	1.6e+00		PCI/GDRY	09/09/2010
Ra223 *	8.94e-01	1.6e-01		PCI/GDRY	09/09/2010
Ra226 *	1.87e+01	2.2e+00		PCI/GDRY	09/09/2010
Ra228	8.75e-01	1.2e-01		PCI/GDRY	09/09/2010
Rn219	7.18e-01	1.8e-01		PCI/GDRY	09/09/2010
Th227	5.06e-01	1.0e-01		PCI/GDRY	09/09/2010
Th234 *	1.36e+01	1.6e+00		PCI/GDRY	09/09/2010
Tl208	2.91e-01	3.8e-02		PCI/GDRY	09/09/2010
U235 *	5.51e-01	6.9e-02		PCI/GDRY	09/09/2010

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**U.S.ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1000029

SAMPLE ANALYSIS REPORT

Sample #:	B0.08000U	QC batch #:	0007002Y
Matrix:	SOIL	Assay batch #:	0014432V
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	3.290e+02 GDRY	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	77.42 %	Analyst:	RCL
Ash/dry weight:	87.80 %	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/30/2010 15:34	1000.0	GE15	RCL

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Ba140	ND		4.3e-01	PCI/GDRY	09/09/2010
Bi212	1.32e+00	3.0e-01		PCI/GDRY	09/09/2010
Bi214 *	1.09e+01	1.3e+00		PCI/GDRY	09/09/2010
Co60	ND		4.2e-02	PCI/GDRY	09/09/2010
Cs137	1.32e-01	2.4e-02		PCI/GDRY	09/09/2010
I131	ND		2.3e-01	PCI/GDRY	09/09/2010
K40	1.22e+01	1.4e+00		PCI/GDRY	09/09/2010
Pb210 *	8.63e+00	1.1e+00		PCI/GDRY	09/09/2010
Pb212	1.06e+00	1.3e-01		PCI/GDRY	09/09/2010
Pb214 *	1.19e+01	1.4e+00		PCI/GDRY	09/09/2010
Ra223 *	8.01e-01	1.4e-01		PCI/GDRY	09/09/2010
Ra226 *	1.54e+01	1.8e+00		PCI/GDRY	09/09/2010
Ra228	9.88e-01	1.3e-01		PCI/GDRY	09/09/2010
Rn219	5.73e-01	1.5e-01		PCI/GDRY	09/09/2010
Th227	4.55e-01	1.1e-01		PCI/GDRY	09/09/2010
Th234 *	1.19e+01	1.4e+00		PCI/GDRY	09/09/2010
Tl208	2.82e-01	3.8e-02		PCI/GDRY	09/09/2010
U235 *	5.60e-01	7.1e-02		PCI/GDRY	09/09/2010

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SDG #1000029

SAMPLE ANALYSIS REPORT

Sample #:	B0.08000U	QC batch #:	0007002Y
Matrix:	SOIL	Assay batch #:	0014432V
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	3.290e+02 GDRY	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	77.42 %	Analyst:	RCL
Ash/dry weight:	87.80 %	QC type:	DUP
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/04/2010 13:54	1000.0	GE07	RCL

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Ba140	ND		5.4e-01	PCI/GDRY	09/09/2010
Bi212	1.06e+00	3.1e-01		PCI/GDRY	09/09/2010
Bi214 *	1.11e+01	1.3e+00		PCI/GDRY	09/09/2010
Co60	ND		4.8e-02	PCI/GDRY	09/09/2010
Cs137	1.40e-01	2.9e-02		PCI/GDRY	09/09/2010
I131	ND		3.2e-01	PCI/GDRY	09/09/2010
K40	1.10e+01	1.3e+00		PCI/GDRY	09/09/2010
Pb212	9.85e-01	1.2e-01		PCI/GDRY	09/09/2010
Pb214 *	1.18e+01	1.4e+00		PCI/GDRY	09/09/2010
Ra223 *	7.16e-01	1.9e-01		PCI/GDRY	09/09/2010
Ra226 *	1.12e+01	1.4e+00		PCI/GDRY	09/09/2010
Ra228	9.15e-01	1.3e-01		PCI/GDRY	09/09/2010
Rn219	7.39e-01	2.3e-01		PCI/GDRY	09/09/2010
Th227	4.32e-01	1.1e-01		PCI/GDRY	09/09/2010
Th234 *	1.17e+01	1.4e+00		PCI/GDRY	09/09/2010
Tl208	2.99e-01	4.3e-02		PCI/GDRY	09/09/2010
U235 *	6.86e-01	8.7e-02		PCI/GDRY	09/09/2010

* An asterisk indicates a result that may be significantly under or overestimated

**U.S.ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1000029

SAMPLE ANALYSIS REPORT

Sample #:	B0.08001V	QC batch #:	0007002Y
Matrix:	SOIL	Assay batch #:	0014432V
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	3.200e+02 GDRY	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	79.44 %	Analyst:	RCL
Ash/dry weight:	84.28 %	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/30/2010 15:34	1000.0	GE16	RCL

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Ba140	ND		1.0e-01	PCI/GDRY	09/09/2010
Bi212	1.37e-01	9.2e-02		PCI/GDRY	09/09/2010
Bi214 *	1.10e-01	1.9e-02		PCI/GDRY	09/09/2010
Co60	ND		1.3e-02	PCI/GDRY	09/09/2010
Cs137	ND		1.1e-02	PCI/GDRY	09/09/2010
I131	ND		5.8e-02	PCI/GDRY	09/09/2010
K40	3.88e-01	7.4e-02		PCI/GDRY	09/09/2010
Pb210 *	3.19e-01	1.2e-01		PCI/GDRY	09/09/2010
Pb212	9.04e-02	1.6e-02		PCI/GDRY	09/09/2010
Pb214 *	1.34e-01	1.9e-02		PCI/GDRY	09/09/2010
Ra226 *	3.79e-01	1.2e-01		PCI/GDRY	09/09/2010
Ra228	9.38e-02	1.8e-02		PCI/GDRY	09/09/2010
Th234 *	1.79e-01	5.6e-02		PCI/GDRY	09/09/2010
Tl208	3.21e-02	8.4e-03		PCI/GDRY	09/09/2010

* An asterisk indicates a result that may be significantly under or overestimated

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1000029

SAMPLE ANALYSIS REPORT

Sample #:	B0.08002W	QC batch #:	0007002Y
Matrix:	SOIL	Assay batch #:	0014432V
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	5.060e+02 GDRY	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	79.50 %	Analyst:	RCL
Ash/dry weight:	93.27 %	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
09/30/2010 15:34	1000.0	GE18	RCL

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Ba140	ND		1.4e-01	PCI/GDRY	09/09/2010
Bi212	1.02e+00	1.7e-01		PCI/GDRY	09/09/2010
Bi214 *	5.13e-01	6.2e-02		PCI/GDRY	09/09/2010
Co60	ND		1.6e-02	PCI/GDRY	09/09/2010
Cs137	3.66e-02	8.5e-03		PCI/GDRY	09/09/2010
I131	ND		6.8e-02	PCI/GDRY	09/09/2010
K40	1.18e+01	1.4e+00		PCI/GDRY	09/09/2010
Pb210 *	4.23e-01	1.4e-01		PCI/GDRY	09/09/2010
Pb212	9.76e-01	1.1e-01		PCI/GDRY	09/09/2010
Pb214 *	5.53e-01	6.6e-02		PCI/GDRY	09/09/2010
Ra223 *	2.23e-01	4.5e-02		PCI/GDRY	09/09/2010
Ra226 *	1.33e+00	2.2e-01		PCI/GDRY	09/09/2010
Ra228	1.01e+00	1.2e-01		PCI/GDRY	09/09/2010
Tl208	3.16e-01	3.8e-02		PCI/GDRY	09/09/2010
U235 *	7.88e-02	1.3e-02		PCI/GDRY	09/09/2010

* An asterisk indicates a result that may be significantly under or overestimated

**U.S.ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1000029

SAMPLE ANALYSIS REPORT

Sample #:	LCS-00592060D	QC batch #:	0007002Y
Matrix:	N/A	Assay batch #:	0014432V
Sample type:	N/A	Prep procedure:	N/A
Amount analyzed:	1.000e+00 SAMP	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	N/A	Analyst:	RCL
Ash/dry weight:	N/A	QC type:	LCS
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/05/2010 15:58	1000.0	GE09	RCL

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Ba133	1.02e+02	1.3e+01		PCI	11/01/2006
Ba140	ND		1.7e+04	PCI	11/01/2006
Co60	6.40e+01	8.7e+00		PCI	11/01/2006
Cs137	1.10e+02	1.4e+01		PCI	11/01/2006
Eu152	9.17e+01	1.3e+01		PCI	11/01/2006
I131	ND		5.1e+03	PCI	11/01/2006
K40	ND		5.5e+01	PCI	11/01/2006
Ra226	ND		9.1e+01	PCI	11/01/2006
Ra228	ND		9.3e+01	PCI	11/01/2006

**U.S.ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1000029

SAMPLE ANALYSIS REPORT

Sample #:	RBK-00592059L	QC batch #:	0007002Y
Matrix:	N/A	Assay batch #:	0014432V
Sample type:	N/A	Prep procedure:	N/A
Amount analyzed:	1.000e+00 SAMP	Analysis procedure:	NAREL GAM-01
Dry/wet weight:	N/A	Analyst:	RCL
Ash/dry weight:	N/A	QC type:	RBK
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
10/04/2010 13:55	1000.0	GE12	RCL

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Ba140	ND		1.5e+01	PCI	09/30/2010
Co60	ND		4.4e+00	PCI	09/30/2010
Cs137	ND		4.1e+00	PCI	09/30/2010
I131	ND		5.0e+00	PCI	09/30/2010
K40	ND		4.0e+01	PCI	09/30/2010
Ra226	ND		5.2e+01	PCI	09/30/2010
Ra228	ND		2.6e+01	PCI	09/30/2010

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG 1000029

QC BATCH SUMMARY

QC batch #: 0007002Y
Preparation procedure: N/A
Analysis procedure: NAREL GAM-01

NAREL Sample #	QC Type	Yield (%)	$\pm 2 \sigma$ Uncertainty (%)	Analyst
B0.07995U	DUP	N/A		RCL
B0.07996V		N/A		RCL
B0.07997W		N/A		RCL
B0.07998X		N/A		RCL
B0.07999Y		N/A		RCL
B0.08000U		N/A		RCL
B0.08000U		N/A		RCL
B0.08001V		N/A		RCL
B0.08002W		N/A		RCL
LCS-00592060D *	LCS	N/A		RCL
RBK-00592059L *	RBK	N/A		RCL

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

National Air and Radiation Environmental Laboratory QC Batch Report

QC Batch #: 0007002Y

Analytical Procedure: NAREL GAM-01

METHOD BLANKS (PCI)

Sample ID	Nuclide	Activity $\pm 2\sigma$	Prep Date
00592059L	BA140		
00592059L	CO60		
00592059L	CS137		
00592059L	I131		
00592059L	K40		
00592059L	RA226		
00592059L	RA228		

LABORATORY DUPLICATES (PCI/GDRY)

Sample ID	Nuclide	Original $\pm 2\sigma$	Duplicate $\pm 2\sigma$	RPD	Z
B0.08000U	BA140				
B0.08000U	BI212	1.32e+00 \pm 3.0e-01	1.06e+00 \pm 3.1e-01	21.85	-1.21 OK
B0.08000U	CO60				
B0.08000U	CS137	1.32e-01 \pm 2.4e-02	1.40e-01 \pm 2.9e-02	5.88	0.43 OK
B0.08000U	I131				
B0.08000U	K40	1.22e+01 \pm 1.4e+00	1.10e+01 \pm 1.3e+00	10.34	-1.23 OK
B0.08000U	PB212	1.06e+00 \pm 1.3e-01	9.85e-01 \pm 1.2e-01	7.33	-0.85 OK
B0.08000U	RA228	9.88e-01 \pm 1.3e-01	9.15e-01 \pm 1.3e-01	7.67	-0.81 OK
B0.08000U	RN219	5.73e-01 \pm 1.5e-01	7.39e-01 \pm 2.3e-01	25.30	1.19 OK
B0.08000U	TH227	4.55e-01 \pm 1.1e-01	4.32e-01 \pm 1.1e-01	5.19	-0.29 OK
B0.08000U	TL208	2.82e-01 \pm 3.8e-02	2.99e-01 \pm 4.3e-02	5.85	0.59 OK

LAB CONTROL SAMPLES (PCI)

Sample ID	Nuclide	Amt Added $\pm 2\sigma$	Measured $\pm 2\sigma$	%R	Z
00592060D	BA133	1.04e+02 \pm 2.1%	1.02e+02 \pm 1.3e+01	98.39	-0.26 OK
00592060D	BA140	NO SPIKE DATA			
00592060D	CO60	7.36e+01 \pm 2.1%	6.40e+01 \pm 8.7e+00	87.00	-2.17 OK
00592060D	CS137	1.16e+02 \pm 2.1%	1.10e+02 \pm 1.4e+01	95.12	-0.81 OK
00592060D	EU152	9.54e+01 \pm 2.1%	9.17e+01 \pm 1.3e+01	96.07	-0.55 OK
00592060D	I131	NO SPIKE DATA			
00592060D	K40	NO SPIKE DATA			
00592060D	RA226	NO SPIKE DATA			
00592060D	RA228	NO SPIKE DATA			

Analyst:

Lowry, Robert C.

10-6-10

QA Officer:

Kim S. McQuinn

10/6/10